ARM Climate Research Facility

Southern Great Plains Newsletter

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SGP Study Will Test Satellite-Borne Instrument

The accuracy of a satellite-based carbon dioxide (CO_2) instrument will be verified using data collected at the SGP during January and February 2006. The new remote sensing technology, developed by the private sector, is to be used for future National Aeronautic and Space Administration and National Oceanic and Atmospheric Administration missions. The instrument is a unique multi-frequency, single-beam laser absorption spectroscopy system designed to measure the mixing ratio of CO_2 from space. The mixing ratio is the proportion of dry air that is composed of CO_2.

Researchers will fly an aircraft over the SGP carrying a prototype of the satellite instrument to gather near-surface measurements of CO_2 during daytime and nighttime under clear and partly cloudy skies. These data will be used in the future to validate remote sensing measurements to be made aboard an orbiting satellite.

OU Studies Precipitation at SGP Site

The University of Oklahoma's School of Meteorology has partnered with Vaisala, Inc., to install a 915-MHz boundary layer radar (BLR) at the SGP's Purcell, Oklahoma, boundary facility for studies of precipitation. The BLR will collect data for one year, beginning in early 2006.

Though the traditional use of a BLR is to measure vertical profiles of winds in the atmosphere, its technology also enables the BLR to measure the fall velocities of raindrops. Knowing the fall velocity, one can calculate the sizes of the water droplets and the drop size distribution (DSD). The DSD is important in several areas, including studies of the evolution of water droplets in and near the melting layer — a region in the atmosphere where frozen precipitation melts and turns into liquid.

Scientists can also use DSD to estimate rainfall amounts. Computer algorithms are applied to polarimetric weather radar data (measured through use of radio waves polarized in two planes) to estimate rainfall totals for a given region.

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Technical Contact: Brad W. Orr
Phone: 630-252-8665
Email: brad.orr@anl.gov
Editor: Donna J. Holdridge
Website: http://www.arm.gov

Estimating rainfall from radar data requires the use an empirical drop size distribution. Using DSDs that represent the actual rainfall rather than an assumed distribution increases the accuracy of the rainfall estimate.

Data collected by the BLR will be compared to measurements made by the National Severe Storms Laboratory (NSSL) polarimetric KOUN WSR-88D weather radar located in Norman, Oklahoma, and also to data from a ground-based disdrometer, an instrument that continuously measures the number and sizes of raindrops directly. Better understanding of rainfall DSD will improve the accuracy of radar-derived precipitation estimates of rainfall events.

More information on the NSSL polarimetric weather radar is on the web:
http://www.cimms.ou.edu/~schuur/dualpol/

Climate Capsule

"Climate Capsule" is a monthly feature introducing climate and weather definitions.

Carbon Dioxide

: chemical compound, CO_2, a colorless, odorless, tasteless gas that is about 1.5 times as dense as nitrogen gas (the major constituent of air) under ordinary conditions of temperature and pressure. Carbon dioxide is a natural part of the atmosphere, making up about 1% of the volume of dry air. Because it is a product of combustion of carbonaceous fuels (coal, coke, fuel oil, gasoline, cooking gas), city air usually contains more CO_2 than country air. The proportion of CO_2 in the atmosphere is growing.

Drop Size Distribution

: the number of drops per unit size interval per unit volume of space over a specified range of sizes.